

AMENDMENTS TO THE CLAIMS

Please cancel Claim 10 without prejudice.

Please add new Claims 44-53 as indicated below.

A complete listing of all claims and their current status is presented below.

1. (Original) A percutaneous device for removing material from a body lumen, comprising:

an elongate, flexible tube having a distal end and a proximal end and defining a passageway therethrough;

a material removal tip on the distal end of the tube, including an outer housing rotationally fixed with respect to the tube and a member permitted to rotate within the outer housing, the outer housing having a lumen extending therethrough and an open distal mouth;

the rotatable member having proximal and distal ends, a central body, and a plurality of circumferentially spaced flanges extending radially outward from the body; and

a shearing member on the housing axially adjacent to the flanges and having a shearing edge to shear material received into the open mouth of the housing between the shearing member and the flanges.

2. (Original) The device of Claim 1 further including a screw thread on the body formed distally with respect to the flanges.

3. (Original) The device of Claim 1, wherein the shearing member extends radially from a wall of the housing lumen.

4. (Original) The device of Claim 3 further comprising shear planes of said shearing member precluding thrombus build-up within said housing lumen.

5. (Original) A rotational medical device comprising:

an elongate flexible tubular body having a proximal end, a distal end and an elongate central lumen;

a cutter housing rotationally fixed to said distal end of said tubular body and a cutter positioned within said cutter housing, said cutter being capable of rotation within said cutter housing;

said cutter housing comprising a lumen and an open distal end;

said cutter comprising proximal and distal ends, a central body and a plurality of flanges extending radially outward from said central body; and

a stationary member positioned on said cutter housing axially adjacent to said flanges and comprising a shearing edge to shear material between said stationary member and said flanges when material is received into said open distal end of said cutter housing.

6. (Original) The device of Claim 5 further comprising a screw thread on said central body of said cutter, said screw thread being formed distally of said flanges.

7. (Original) The device of Claim 5, wherein said stationary member extends radially inward into said housing lumen.

8. (Original) The device of Claim 7, wherein said stationary member defines a shear plane and said shear plane precluding thrombus build-up within said housing lumen.

9. (Original) A material removal tip for a catheter-mounted device, comprising: a rotatable member having a body and at least one circumferentially spaced outwardly projecting shearing member; and a generally tubular housing sized to receive said rotatable member, said housing including at least one stationary shearing member located axially adjacent said shearing member on said rotatable member for shearing material received in said housing between said adjacent rotating and stationary shearing members and reduce the clogging propensity of said material.

10. (Canceled)

11. (Original) The device of Claim 9, wherein said stationary shearing member is located distally with respect to said rotating shearing member.

12. (Original) The device of Claim 9, wherein said stationary shearing member is located proximally with respect to said rotating shearing member.

13. (Original) The device of Claim 9, wherein said housing includes proximal and distal sections, said distal section defining a first lumen for closely receiving said rotatable member, said proximal section defining a second lumen coaxial with said first lumen, and a larger annular groove formed between said first and second lumens for receiving said rotatable

shearing members and axially restricting movement of said rotatable member, said stationary shearing member being located adjacent said groove.

14. (Original) The device of Claim 13, wherein said stationary shearing member is located distally with respect to said rotatable shearing members and projects inwardly from said first lumen.

15. (Original) The device of Claim 13, wherein said stationary shearing member is located proximally with respect to said rotatable shearing members and projects inwardly from said second lumen.

16. (Original) The device of Claim 13, wherein said housing is formed in one piece, and said rotatable shearing members are cantilevered with respect to said body of said rotatable member to enable said rotatable shearing members to be snap-fit into said groove.

17. (Original) The device of Claim 13, wherein said proximal and distal sections of said housing are separate pieces with said groove defined therebetween.

18. (Original) The device of Claim 17, wherein said stationary shearing member is formed on said distal section of said housing.

19. (Original) The device of Claim 17, wherein said stationary shearing member is formed on said proximal section of said housing.

20. (Original) The device of Claim 9, having at least about a plurality of said stationary and said rotatable shearing members, wherein said stationary shearing members extend radially inward into close proximity with said bodies of said rotatable members to define shearing planes for simultaneous coarse, medium and fine cutting.

21. (Original) The device of Claim 9, having a total preselected diameter effective for use in a preselected body lumen.

22. (Original) The device of Claim 21, wherein said preselected body lumen is a blood vessel.

23. (Original) The device of Claim 9, wherein said generally tubular housing is a one-piece housing.

24. (Original) The device of Claim 9, wherein said generally tubular housing is fabricated from at least two pieces, wherein said pieces are joined by means for joining.

25. (Original) The device of Claim 24, wherein said means for joining are selected from the group consisting of welds, adhesives, press-fitting and mechanical means for interlocking.

26. (Original) A cutter tip for a surgical instrument comprising: a cutter having a body and at least one circumferentially spaced outwardly projecting flange; and a generally tubular cutter housing sized to receive said cutter, said cutter housing including at least one stationary shearing member located axially adjacent said flange on said cutter for shearing material received in said cutter housing between said flange and said stationary shearing members and reduce the clogging propensity of said material.

27. (Original) The device of Claim 26 wherein said cutter housing includes proximal and distal sections, said distal section defining a first lumen for closely receiving said cutter, said proximal section defining a second lumen coaxial with said first lumen, and a larger annular race formed between said first and second lumens for receiving said flange and axially restricting movement of said cutter, said stationary shearing member being located adjacent said race.

28. (Original) The device of Claim 26, wherein said stationary shearing member is located distally with respect to said rotating flange.

29. (Original) The device of Claim 26, wherein said stationary shearing member is located proximally with respect to said rotating flange.

30. (Original) The device of Claim 26, wherein said cutter housing includes proximal and distal sections, said distal section defining a first lumen for closely receiving said cutter, said proximal section defining a second lumen coaxial with said first lumen, and a larger annular race formed between said first and second lumens for receiving said rotatable flange and axially restricting movement of said cutter, said stationary shearing member being located adjacent said groove.

31. (Original) The device of Claim 30, wherein said stationary shearing member is located distally with respect to said rotatable flange and projects inwardly from said first lumen.

32. (Original) The device of Claim 30, wherein said stationary shearing member is located proximally with respect to said rotatable flange and projects inwardly from said second lumen.

33. (Original) The device of Claim 30, wherein said cutter housing is formed in one piece, and said rotatable flanges are cantilevered with respect to said body of said cutter to enable said rotatable flanges to be snap-fit into said race.

34. (Original) The device of Claim 30, wherein said proximal and distal sections of said cutter housing are separate pieces with said race defined therebetween.

35. (Original) The device of Claim 34, wherein said stationary shearing member is formed on said distal section of said cutter housing.

36. (Original) The device of Claim 34, wherein said stationary shearing member is formed on said proximal section of said cutter housing.

37. (Original) The device of Claim 26 having at least about a plurality of said stationary shearing members and said rotatable flanges, wherein said stationary shearing members extend radially inward into close proximity with said bodies of said flanges to define shearing planes for simultaneous coarse, medium and fine cutting.

38. (Original) The device of Claim 26 having a total preselected diameter effective for use in a preselected body lumen.

39. (Original) The device of Claim 38, wherein said preselected body lumen is a blood vessel.

40. (Original) The device of Claim 26, wherein said generally tubular cutter housing is a one-piece housing.

41. (Original) The device of Claim 26, wherein said generally tubular cutter housing is fabricated from at least two pieces, wherein said pieces are joined by means for joining.

42. (Original) The device of Claim 41, wherein said means for joining are selected from the group consisting of welds, adhesives, press-fitting and mechanical means for interlocking.

43. (Original) A method of removing thrombus material from a thrombectomy site, the method comprising:

providing a rotational medical device comprising:

an elongate flexible tubular body having a proximal end, a distal end, and an elongate central lumen; and

a vacuum system coupled to said elongate flexible tubular body, said vacuum system comprising a vacuum manifold having first and second outlets,

said vacuum manifold being connected to a hose at said first outlet and a motor at said second outlet;

placing said distal end of said elongate flexible tubular body in proximity to a thrombus at said thrombectomy site; and

activating said vacuum system such that a portion of said thrombus is drawn into said elongate central lumen.

44. (New) A method of removing material from a preselected body lumen in a patient in need of such removal, comprising: advancing through said body lumen a catheter-mounted device having a distal material removal tip including a hollow housing and a member rotatable therewithin; rotating the rotatable member; drawing said material into said housing; shearing said material in said housing between relatively rotating shearing members to reduce the clogging propensity of said material; and removing said sheared material from within said housing as said material removal tip is advanced through said body lumen.

45. (New) The method of claim 1, further including: first coarsely chopping said material in said housing; then, finely chopping said material in said housing during said step of shearing.

46. (New) The method of claim 1, wherein said rotatable member includes a screw thread and said step of coarsely chopping said material in said housing is accomplished by contact between said screw thread and said material.

47. (New) The method of claim 1, wherein the step of shearing includes cutting material in a scissor-like manner between opposed shearing edges provided on said relatively rotating shearing members.

48. (New) The method of claim 4, wherein at least about a plurality of said opposed shearing edges define shearing planes for simultaneous coarse, medium and fine cutting.

49. (New) The method of claim 5, wherein said opposed shearing edges define said shearing planes comprising a range of dimensions up to about 0.05 mm (about 0.002 inches) for simultaneous coarse, medium and fine shearing.

50. (New) The method of claim 1 wherein said catheter-mounted device having a distal material removal tip has a total preselected diameter effective for use in said preselected body lumen.

51. (New) The method of claim 7 wherein said preselected body lumen is selected from the group consisting of blood vessels, lymph vessels, lumens for the passage of bile, lumens for the passage of urine, and gastrointestinal lumens.

52. (New) A rotational medical device comprising:  
an elongate flexible tubular body having a proximal end and a distal end;  
a rotatable element extending through the body;  
a rotatable tip at the distal end of the body and connected to the rotatable element;  
and  
the rotatable tip further comprising a radially inwardly extending annular recess.

53. (New) A rotational medical device as in claim 20, wherein the tubular body further comprises a plurality of radially inwardly extending retaining members for rotatably engaging the annular recess.